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Filling gaps in the disjunct distribution of *Rhinoclemmys punctularia* (Daudin, 1801) (Testudines: Geoemydidae) and first record from Bahia state, northeast Brazil

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Abstract: *Rhinoclemmys punctularia* (Daudin, 1801) inhabits rivers and lakes primarily in the Amazon region, with a disjunct population in southeastern Brazil. Herein we present the second record of *R. punctularia* from the Atlantic rainforest and the first from the state of Bahia, northeast Brazil. We recorded four specimens over a decade in different habitats from the north coast of Bahia. Our records fill distribution gaps of 980 km from the northern record in Maranhão and 1,130 km from the southern population.

Key words: Atlantic rainforest; Aperema; Cryptodira; Salvador

Among the 773 species of Brazilian reptiles, Testudines contribute 36 species in eight families. Five of these families contain 29 aquatic or semiaquatic species (Costa and Bérnils 2015). In Brazil, *Rhinoclemmys punctularia* (Daudin, 1801) is the only species belonging to the Geoemydidae and is popularly known as Aperema. This species may be found in several aquatic habitats, including rivers, lakes, *igapós* and temporary ponds (Gans 1980; Ernst and Barbour 1989; Wariss et al. 2012; Pereira et al. 2013). It is widely distributed in northern South America across the Amazon basin from western Venezuela eastward to Trinidad and Tobago and northern Guyana, Suriname and French Guiana (Pritchard and Trebbau 1984; Ernst and Barbour 1989; Rueda-Almonacid et al. 2007; Ouboter et al. 2007). In Brazil, the species occurs mainly in northern and northeastern regions within the Amazon and Cerrado domains in Roraima, Amazonas, Amapá, Pará, Tocantins and Maranhão states (Scheider et al. 2009; Ávila-Pires et al. 2010; Dornas et al. 2011; Silva et al. 2011; Wariss et al. 2012; Pereira et al. 2013). Recently, Siciliano et al. (2014) reported the occurrence of *R. punctularia* in the coastal plains of Rio de Janeiro, southeastern Brazil, which apparently is a discontinuous distribution from the records from northern and northeastern Brazil. Furthermore, the knowledge of freshwater turtles in northeastern Brazil is scarce regarding habitat use and distribution for several species, essential information for conservation (Souza 2004). Herein, we provide an updated distribution map and the first occurrence of *R. punctularia* in the state of Bahia, northeastern Brazil, with information regarding the species' habitat use in the region.

We recorded, through direct sighting and manual capture, four specimens of *R. punctularia* over a decade in distinct habitats on the north coast of Bahia state (Figure 1). The first record was an adult male of 168.7 mm carapace length, 115.6 mm carapace width, 149.5 mm plastron length, and 114.9 mm plastron width (Figure 2) captured at Praia do Forte, municipality of Mata de São João, at the coastal lake Timeantube, in restinga habitat (12.571561° S, 038.009197° W, 8 m above sea level [a.s.l.]) on 9 May 2005. Our second record was an unsexed hatchling of 54.9 mm plastron length, 53.7 mm plastron width and 23 mm carapace height from the Botanic Garden of Salvador (12.928810° S, 038.4251520° W, 43 m a.s.l.), a 5-ha fragment of ombrophilous forest in the municipality of Salvador on 4 May 2011. The third record was an adult basking at the margin of the Joanes River within ombrophilous forest habitat in the municipality of Lauro de Freitas (12.838° S, 038.328° W, 27 m a.s.l.) on 13 June 2012. The last record was an adult of 215 mm carapace length, 200 mm carapace width, 90 mm carapace height, 200 mm plastron length and 155

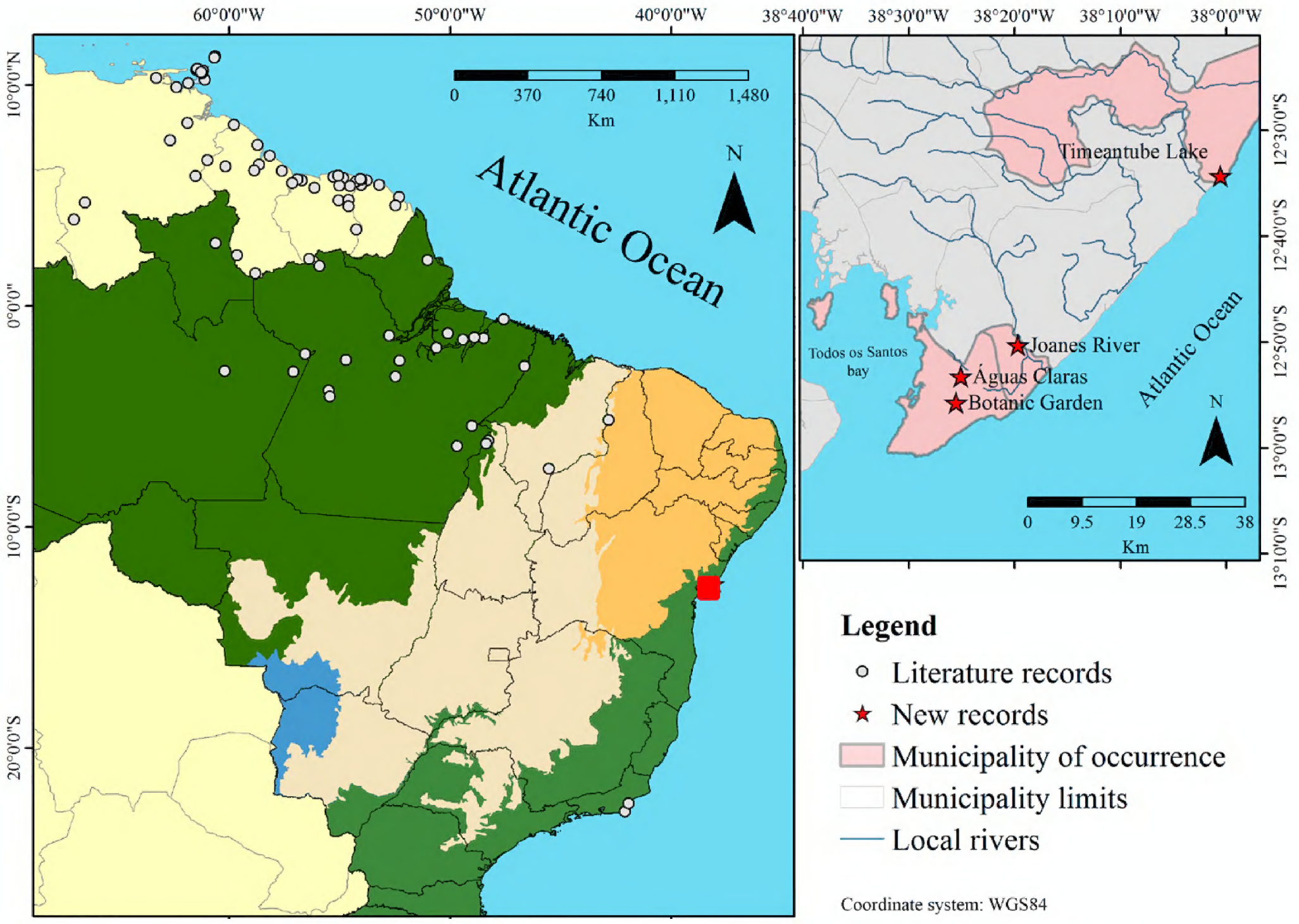

Figure 1. Distribution map of *Rhinoclemmys punctularia* in South America on the left. Gray circles are literature records extracted from: Pritchard and Trebbau 1984; Scheneider et al. 2009; Ávila-Pires et al. 2010; Dornas et al. 2011; Mendes-Pinto and Souza 2011; Silva et al. 2011; Wariss et al. 2012; Pereira et al. 2013; Siciliano et al. 2014. The right map shows the new records in red stars in the north coast of Bahia, northeast Brazil.

mm plastron width, captured on a road near a small ombrophilous forest remnant in Águas Claras, municipality of Salvador (12.887647° S, 038.417824° W, 64 m a.s.l.) on 20 February 2016. We collected tissue of the last record, preserved it in 99% ethanol and deposited in the herpetological reference collection of the Centro de Ecologia e Conservação Animal (CHECOA 3793) at Universidade Católica do Salvador. Animals were captured under permit SISBio 23355-4, issued by MST (Moacir Santos Tinôco) from the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio).

Rhinoclemmys punctularia is distinguished by a dorsal head pattern of oblique yellow to reddish stripes running from the nape to above the eye and a light spot on the snout in front of each eye. Forelimb scales are yellow or red with black spots and the plastron is reddish brown to black with yellowish border (Ernst 1981; Ernst and Barbour 1989).

The four records are 4 to 45 km from each other. These records are 980 km from the nearest northern record in the municipality of Sambaíba, state of Maranhão (Pereira et al. 2013) and 1,130 km from the nearest southern record in Rio das Ostras, state of Rio de Janeiro (Siciliano et al. 2014). Siciliano et al. (2014) speculated that the specimens in Rio de Janeiro are from captive breeding or transported from Amazonian populations. We also considered this possibility for the Bahia specimens, but the species is not targeted for illegal wildlife trade market and captive breeding (RENCTAS 2001). Therefore, it is unlikely that illegal trade is the reason for these new records from the Atlantic forest, but not elsewhere.

As suggested by Wariss et al. (2012) and Pereira et al. (2013), *R. punctularia* appears to inhabit several habitat types, which reflects its extensive distribution. Although the species is mainly distributed in the Amazon basin and transition areas from Cerrado, the records of Siciliano et al. (2014) from Rio de Janeiro state and our records in Bahia state reveal the species has a disjunct distribution in the Atlantic forest domain. Floristic and fauna studies suggest a past connection between the Amazon and the Atlantic forest during the Paleogene, later divided by the South American dry Diagonal on Pleistocene (Ab'Saber 1977; Morley 2000; Costa 2003; Martini et al. 2007;

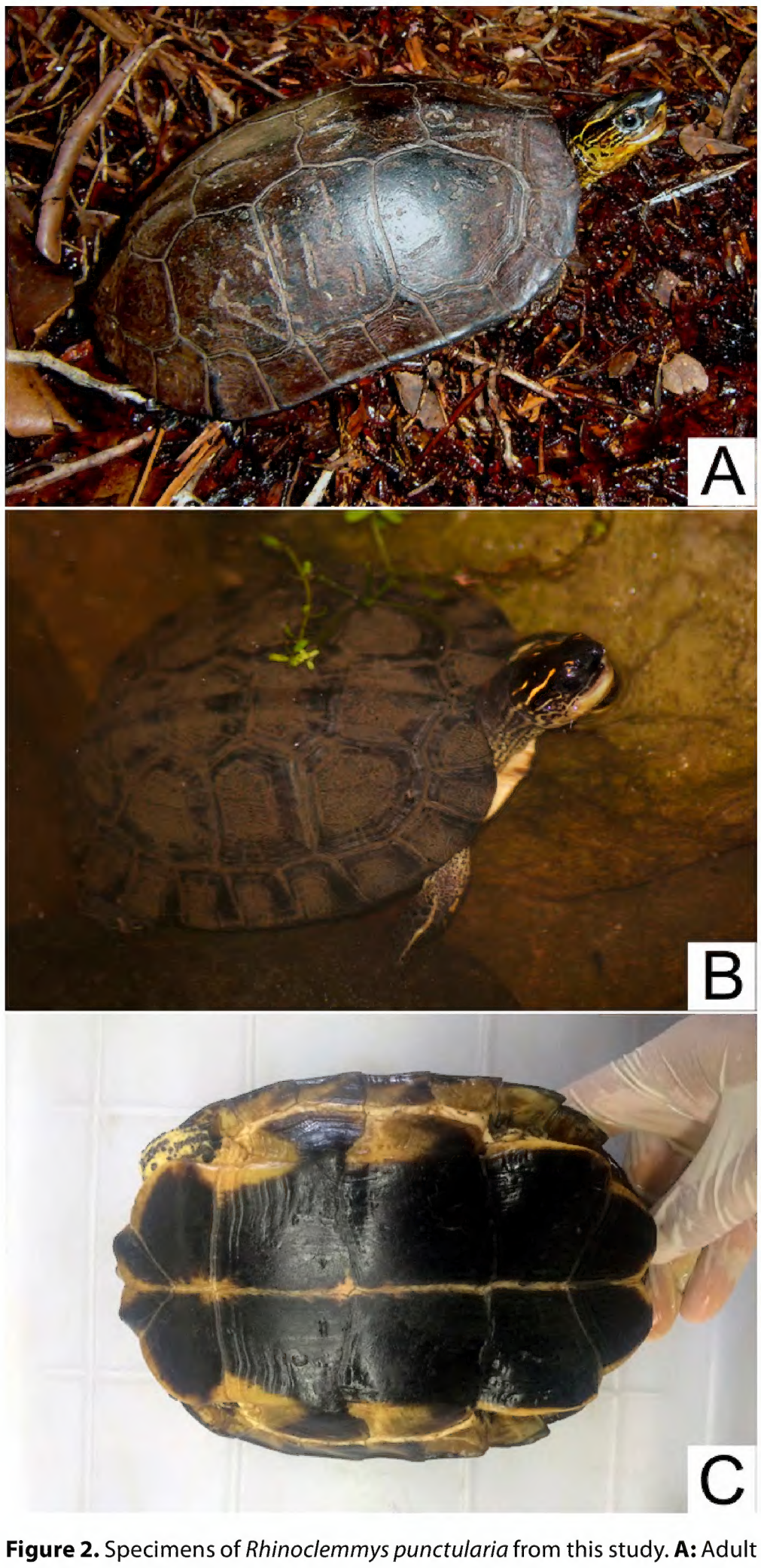

Figure 2. Specimens of *Rhinoclemmys punctularia* from this study. **A:** Adult male, plastron length 149.5 mm, from Timeantube Lake, municipality of Praia do Forte. **B:** Juvenile, PL 54.9 mm, from Botanic Garden of Salvador. **C:** Unsexed adult, PL 200 mm, from Águas Claras, municipality of Salvador. Photos by MST, RM and MFV.

Batalha-Filho et al. 2013; Sobral-Souza et al. 2015). This may explain these disjunct distributions, although further study is required on this, as well as field surveys in the past-connection regions to confirm its absence.

This study reports *Rhinoclemmys punctularia* from several coastal habitats and strengthens the presence of the species in the Atlantic forest domain. However, further efforts are needed to provide information regarding its distribution, ecology and biology, especially in the state of Bahia, which lacks studies on Testudines.

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